MEASUREMENT EFFECT ON THE ABNORMAL RETURNS SURROUNDING THE STOCK-SPLIT EX-DATES IN THE SPANISH STOCK MARKET

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ABSTRACT

This paper examines the empirical behaviour of share prices around the dates of splits, with a view to detecting the possible creation of anomalous returns. It also examines the determining factors of splits, their effects on liquidity and the influence of the market's microstructure in the generating of abnormal returns. The evidence obtained from the Spanish capital market indicates that splits generate an average abnormal return of about 1%, principally on the day that the split is effected. This result cannot be explained by an increase in liquidity. It suggests, rather, that certain microstructure phenomena in the market encourage an increase in abnormal returns. Approximately half of these increased returns could be attributed to two factors: changes in the order flow and an increase in the relative spread, induced by an uneven increase in the ask price with respect to the bid.

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INTRODUCTION

A split occurs when a firm decides to reduce the par value of its shares, increasing the number of securities issued, without altering its capital. No other factor or contract is affected by this decision, so that it doesn't alter either present or future cash flows, nor the rights that the different agents have over them. With such characteristics, when a split occurs in a perfect market, the reduction in the price of the shares should be proportional to the division that has been carried out, with the company's market value remaining constant.

The empirical evidence, however, contradicts these foregoing statements, and it is a well-documented fact that splits are important economic events that generate anomalous returns (Grinblatt, Masulis and Titman, 1984), not only on their announcement dates but also on the dates that they are actually done. On the announcement date, the valuation effect has been explained, basically, by the informative content of the split. But the behaviour of the stock's prices on the split ex date, which is known to investors well in advance, is more difficult to interpret in this light, since there are neither further revelations of any new information, nor any associated tax effects. In this regard, the explanation for these abnormal returns seems to be the increase in the stock's liquidity.

The basic belief behind this hypothesis is that the company's managers use the split to convey favorable private information to the market about the future prospects for the firm. In this sense, splits are associated with an increase in dividends (Fame, Fisher, Jensen and Roll, 1969), and in earnings (McNichols and Dravid, 1990; Lakonishok and Lev, 1987; Asquith, Healey and Palepu, 1989; Pilotte and Manuel, 1996).

According to the liquidity hypothesis, splits are associated with high stock price levels. A common characteristic of splitting companies is that their shares have experienced an appreciable price run-up prior to the ex date. The objective of a split, therefore, is to reduce the share price to a lower level that is considered its normal price range. The underlying logic is that a conventional price can improve liquidity, increasing the stock's value (Baker and Phillips, 1994). There are several reasons for which there could be an improvement in liquidity. In the first place, the lower prices are inherently attractive and tend to draw new investors. A second reason is that the improved negotiating range balances the preferences between smaller and larger investors, given the structure of the transaction costs (Brennan and Hughes, 1991). For another thing, at lower prices, the market maker's revenues from brokerage commissions, which depend on the number of shares they negotiate, increase greatly, so they have an incentive to pro-

mote the newly split shares. Finally, splits increase the relative minimum variation of the price (relative tick), reducing the transaction costs, providing greater incentives to the specialists and encouraging the investors who operate with limit orders (Angel, 1997).

Splits are a relatively recent phenomenon in the Spanish stock market and have created enormous interest among analysts, investors and researchers. The objective of this study is, basically, to analyze the behaviour of the prices of the split shares around the date of its execution, to try and detect the possible generation of anomalous ex day returns. At the same time, we examine the factors that could determine the split factor, their effects on the liquidity of the security, and the influence of the microstructure of the market on the generation of abnormal returns.

The evidence obtained from the Spanish capital market indicates that splits generate an average abnormal return of about 1%, principally on the ex day, which cannot be explained by an improvement in the asset's liquidity. The results suggest that there could be certain microstructure phenomena that influence the average abnormal returns. Approximately half of this could be attributed to the combined effects of changes caused in the order flow and an increase in the relative spread, induced by an asymmetrical increase in the ask price with respect to the bid.

This study is organized in six sections. In the following paragraphs, the sample selection procedure and the data used are described. In the third section, the methodology used to estimate the abnormal returns around the split ex date and the results obtained, are presented. The fourth section analyzes the possible determinants of the split factor. In the fifth section, the effects of splits on the trading activity of the assets and on the cost of liquidity are examined. The sixth section includes an analysis of the influence of institutional factors on the behaviour of the prices, and in the seventh section, the conclusions are presented.

SAMPLE AND DATA

Between 1988 and 1997, a total of 32 splits were carried out in the Spanish capital market. Eleven of these were done on stocks that were trading in the open outcry system at the actual date of the split execution, and twenty-one others on shares trading on the continuous auction system. For this study, the following criteria for sample selection have been applied. In the first place, the analysis focuses on those splits that have taken place in the continuous market, to avoid the problems inherent in different trading systems. Secondly, for a security to be included in the sample, data regarding its closing price, volume, number of trades per day for a stock, depth of the market and ask and bid quotes, for the hundred and fifty-six trading days surrounding the splits would have to be available (the 150 days preceding the split, the ex-split date, and the five days following it). By applying theses filter, we have had to delete Picking Pack from the set of splitting companies; (this firm issued ten new shares for each old one in 1991). The final sample, therefore, is comprised of twenty stock splits, carried out in the years 1994, 1996 and 1997.

In Table A1 of the appendix, the test sample is detailed, specifying the name of the security, its market code (ticker), the ex date, the split ratio and the previous and subsequent par value of the shares. The split ratio is the quotient between the total number of shares issued before and after the operation. The split factor is the growth rate in the number of shares. The split ratio is equal to one, plus the split factor.

As we can see in Table A1, in the first two years there were only four splits, while in 1997 there were sixteen. We can also appreciate that the size of the splits are much greater during the 1994-96 period than in 1997. For the former years, the split ratio is evaluated at between five and twelve, with an average factor of 9.25, while it is between two and five, with an average of 3.125 in the year 1997. For the entire sample period the average split ratio is 4.4.

On the other hand, a high degree of time and industry concentration is noticed. The splits are usually carried out on a Monday (13), and during the months of July, October and December. With regard to the sector, they have been more common among banks (6), in the cement and construction sector (5), and in trade and services (4).

We use daily continuously compounded returns, computed as the natural logarithm of the quotient of the prices on two consecutive days, $R_{it} = LnP_{it} - LnP_{it-1}$, taking the corrections for dividends, equity rights, splits, etc, into account. The return of the index IBEX35 has been used as a proxy of the market return. All the information has been taken from the Servicio de Información Bursátil (Madrid Stock Exchange Information Service), (S.I.B) daily master file.

THE MOVEMENT IN PRICES AROUND THE SPLIT EX DATE

Contrary to theoretical predictions, the empirical evidence has demonstrated that splits have a positive and significant effect on the stock's market value. Several studies have shown that splits generate abnormal returns on several days around the split ex date. Indeed, Grinblatt, Masulis and Titman (1984), found a positive daily average return of 0.69%, on the ex-split date, and significantly positive abnormal returns on the two following days. Lakonishok and Vermaelen (1986) observed an average profitability of 0.74% on the ex date and significant returns between days –5, to +2. Other studies, however, have found that the valuation effect is concentrated exclusively on the ex date, and did not extend to the adjacent days. In this regard, Lamoroux and Poon (1987) observed positive abnormal returns of 0.57% on the day before, while Kryzanowski and Zhang (1993) found an average extraordinary return of 0.78% on the split ex date, in a sample of 197 assets on the Toronto Stock Exchange.

The effect of the split on the value of the security is now analyzed, examining the movement in prices around the split ex date. The abnormal returns are estimated, using the event studies methodology taking the market model as the standard of normal returns. The estimate of the model is done by using the returns from the 145 days before the event, from $T_0 = -150$ to $T_1=-6$, relative to the ex-split date. As event windows, we take an interval of eleven days, centered on the actual execution date, between $T_1+1 = -5$ and $T_2 = +5$.

$$AR_{i\tau} = R_{i\tau} - \mathbf{x}'_{\tau}\mathbf{b}_i, \qquad T_1 < \tau \leq T_2$$

Where, $AR_{i\tau}$ is the estimator of the abnormal returns on the asset i on the day τ of the event period; $R_{i\tau}$ is the observed return on the asset i on the day τ, x'_{τ} is a (1×2) file vector with a unitary element in the first column and with the market return on the date τ, $R_{m\tau}$ in the second column, and b_i is a (2×1) column vector of estimated coefficients. The estimates and the tests are carried out on the assumption that the random error and the returns are time independent and follow a normal distribution with a constant variance.

The average abnormal return estimated by OLS for each day of the event period, with the standard market model, are outlined in the second column of Table 1. A certain symmetry can be seen in the behavior of the prices, both before and after the split. Presplit returns are positive on days –3 and –1, and negative on the three other days, while in the five days after the ex-split date, positive returns are seen on days +1 and +3. Nevertheless, there is no average abnormal return, either before or after the split, that is statistically different from zero at conventional levels. On the ex date, the average abnormal return is positive, at 0.93%, and highly significant (t-statistic = 2.17 and a p value of 0.04). On the whole, the cumulated abnormal returns for the five days that precede the split, at –0.86%, is less than those generated subsequently during the five later days, -0.02%, although neither of these figures could be considered as being significantly different from zero.

TABLE 1: ABNORMAL SPLIT EX DATE RETURN

DAY	AAR_τ	T	$AARG_\tau$	T	AAR_τ- $AARG_\tau$
-5	-0.528	-1.23	-0.524	-1.28	-0.004
-4	-0.163	-0.38	-0.168	-0.41	0.005
-3	0.446	1.03	0.373	0.91	0.072
-2	-0.625	-1.45	-0.645	-1.56	0.020
-1	0.002	0.00	0.099	0.24	-0.097
0	0.934	2.17	1.029	2.47	-0.095
1	0.308	0.71	0.295	0.71	0.012
2	-0.098	-0.23	-0.024	-0.06	-0.074
3	0.074	0.17	-0.022	-0.05	0.096
4	-0.117	-0.27	0.013	0.03	-0.130
5	-0.190	-0.44	-0.008	-0.02	-0.182
$CAAR(\tau_1, \tau_2)$					
(-5,-1)	-0.868	-0.90	-0.865	-0.94	-0.003
(+1,+5)	-0.024	-0.02	0.254	0.27	-0.278

However, the previous average abnormal returns may well be incorrect. A series of papers have demonstrated that time series of daily returns exhibit certain empiric characteristics, like kurtosis and persistent heteroscedasticity, which could cause a loss of efficiency in the estimators of the parameters. The GARCH approach proposed by Engle and Bollerslev (1986) allows us to introduce these properties of the daily returns appropriately into the market model. In fact, Corhay and Rad (1996) and Kryzanovski and Zhang (1993), suggest that the average abnormal returns found in previous empirical research, may well be the result of the inefficiency in the estimators of the parameters, and that the GARCH correction could make them statistically insignificant.

Bollerslev, Engle and Nelson (1994) point out that the conditional heteroscedasticity in the series of financial returns could be captured by including in the equation just one lag in the square errors and in the conditional variance. Following their suggestion, the market model equation has been corrected by heteroscedasticity, applying a GARCH(1,1) process.

The return generating process is defined as,

$$R_{i\tau} = \mathbf{x}'_{\tau}\beta_i + \varepsilon_{i\tau}, \qquad \tau=-150,...,-6$$

$$\varepsilon_{i\tau} = \eta_{i\tau}\sqrt{h_{it}}, \qquad \eta_{i\tau} \approx NID(0, h_{i\tau})$$

in which, x'_{τ}, is a file vector like that of equation (1), β_i is a three by one column vector of parameters, $\varepsilon_{i\tau}$ is the random error and $h_{i\tau}$, the conditional variance, $h_{i\tau} = E_{\tau-1}(\varepsilon^2_{i\tau})$, so that,

$$\varepsilon_{i\tau} \left| \varepsilon_{i\tau-1}, \varepsilon_{i\tau-2}, ... \right. \approx N(0, h_{i\tau})$$

Under (3) and (4), $h_{i\tau}$ is characterized as a GARCH (1,1) process, by means of the following equation,

$$h_{it} = \alpha_0 + \alpha_1 \varepsilon^2_{it-1} + \beta h_{t-1},$$

in which, $\alpha_i \geq 0$, $\beta > 0$.

In the fourth column of Table 1, the estimated average abnormal returns in the market model corrected by GARCH effects are shown. The results obtained demonstrate that the valuation effect of splits doesn't disappear when this factor is controlled. In the sixth column, we outline the difference between the average abnormal returns estimated with both the basic market model and with the corrected market model. The positive figures indicate that after the corrections, the abnormal average returns are less on four days of the event period, but greater, as their negative signs indicate, on the other six days. Only the return on the ex-split day is statistically significant, at 1.02%, and greater than what has been noticed so far in other markets. The cumulated average returns continue to be around -0.86% in the five-day period preceding the split, but the cumulated postsplit returns become positive, in the order of 0.25%.

Therefore, the analysis done on the movement of the stock price around the split ex day estimating the abnormal returns with the market model, confirm that the effect of splits is concentrated on the ex date, with no significant abnormal increment in prices on the previous or following days. The evidence obtained allows us to confirm that the observed abnormal returns are not the result of an incorrect specification of the model, which ignores characteristics of the daily returns like GARCH effects.

THE DETERMINANTS OF THE SPLIT FACTOR

The valuation effect detected in the previous section has no theoretical justification, either from the signaling hypothesis or from a tax perspective. For this reason, from this section on, we try to explain this effect from the liquidity hypothesis approach, beginning with an analysis of the split factor.

In general, share prices show a sharp increase preceding splits, which pushes them up to considerably high levels. With the split the price falls inversely proportionate to the split ratio chosen. In arguing that the most important motive for the split is to situate the security prices at a lower level, one that is closer to what is considered its conventional range, the liquidity hypothesis suggests there is an implicit target price. In this sense, the managers would choose the split factor that adjusts the stock price to the target price. Lakonishok and Lev (1987), suggest that there is an ideal negotiating range, common to all the splitting shares, which is the average market price. However, the fact that certain companies with lower prices than their group average do decide to carry out splits, indicates that the choice of the split factor can also be determined by the average price of similar stocks. The comparable firms could be either other companies within the same industry (Lakonishok and Lev, 1987; Rozeff; 1998), or companies of a similar size (McNichols and Dravid 1990; Defeo and Jain, 1991).

In this section we examine three factors that could determine the choice of the split factor in the Spanish capital market: the pre-split price of the assets, $P_{i,-1}$, the average market price on the day before the split, $\overline{P}_{m-1}$, and the average pre-split price of the other firms of similar size, $\overline{P}_{s-1}$. This last factor has been calculated by classifying the stocks into ten groups, based on their equity market value on the last day of the year previous to the split, and then computing their average prices on the day after the split. To each split share we assign the average price of its group, selected according to company size. The cross section of the split ratio is then regressed on these three independent variables in the following way:

$$Ln(FD_i) = \alpha_0 + \alpha_1 LnP_{i,-1} + \alpha_2 Ln\overline{P}_{m,-1} + \alpha_3 Ln\overline{P}_{s,-1} + u_i \qquad (0.6)$$

At first sight, it would seem logical to expect that the sign of α_1 would be positive; in other words, that the higher the presplit price, the higher the split factor would be. The sign expected for α_2 is negative, so that the greater the average market price, the lower the split should be, and furthermore, according to the evidence offered by Stoll and Whaley (1983), the sign of α_3 has to be negative, indicating that the larger companies prefer to keep their stock prices at higher levels.

TABLE 2. DETERMINING FACTORS OF THE SPLIT FACTOR.

	α_i	T	P VALUE	R^2 ADJUSTED	F (PROB.)
INTERCEPT	17.73	6.51	0.00	0.62	11.31
PRE-SPLIT PRICE OF THE ASSET	0.48	4.85	0.00		0.00
PRE-SPLIT AVERAGE MARKET PRICE	-2.19	-7.15	0.00		
PRE-SPLIT AVERAGE PRICE OF THE SIZE PORTFOLIO	-0.21	-1.79	0.09		

In Table 2, the results of the estimation of the previous model by OLS are presented. All the coefficients have their expected signs and they are statistically significant, which is consistent with the idea that companies split their shares in order to place them within a specific price range. The coefficient associated with the size variable is statistically different from zero, which confirms the fact that large stocks prefer a higher price range. The previous variables explain approximately 62% of the cross-sectional variability of the split factor, from which one can state that the presplit stock price, the average market price and the mean price of the companies of equivalent size, serve as references in the choice of a split factor.

EFFECTS OF THE SPLIT ON STOCK LIQUIDITY

In the previous section, evidence has been offered that supports the hypothesis that an important reason for carrying out splits is to reduce the price of the shares as a way of attracting new investors. In this section, we analyze whether the decision to split stocks in order to return their prices to a more appropriate level, really offers advantages in terms of the stock's liquidity or not. If the hypothesis of the trading range is true, some sort of improvement should be observed in the different variables associated with liquidity, on the date of the split. If there are no changes made to the investor investment strategy, the increase in the number of shareholders should cause a growth in the variables related to the trading activity, such as the depth, the volume and the frequency of the trades. Also, given the preference of the smaller investors for lower- priced shares, (Black, 1986), their number should increase, reducing the average size of the trades. Among the variables that affect the cost of liquidity, the absolute spread should be reduced; inversely proportional to the split factor, and the percentage spread should remain relatively constant.

In general, with the exception of Lakonishok and Lev (1987) who haven't observed any permanent effect on the volume, all the studies that have been carried out conclude that the volume decreases after the split (Copeland, 1979; Lamoroux and Poon, 1986; Murray, 1985; Desai, Nimalendran and Venkatraman, 1998). On the other hand, Maloney and Mulhein (1992), find that the number of trades increases as a result of the split, and Gray, Smith and Whaley (1996), detect an increment in the depth, measured in number of shares. The combined evidence that the negotiated value falls and the number of trades increases, means that the average value of each trade is smaller, which is consistent with the hypothesis that these decisions attract the smaller investors.

Regarding the absolute spread, the evidence previously given is contradictory. Copeland (1979) finds a statistically significant increase in a sample of 162 OTC securities over the period 1968 through 1976. Murray (1985) doesn't find any evidence of spread change in relation to a control group, in a sample

of 100 OTC splits during the period 1972-76, and Conroy, Harris and Benet (1990) observe that it drops significantly. As for the percentage spread, Conroy, Harris and Benet (1990) and Desai et al., (1998) claim that it experiences a significant increase.

In this study, liquidity is characterized basically by two variables: depth and percentage spread. The depth is the sum of the shares available for immediate exchange, at the prevailing bid and ask quotes. The percentage spread is the cost of the liquidity and it is measured as the difference between both prices, standardized by its arithmetic mean. The liquidity will inevitably improve if the depth increases and the proportional bid/ask spread decreases (Rubio and Tapia, 1996). Other indicators are also used to characterize the trading activity of the split assets, such as the volume, the number of trades per day and their average size.

The effect of splits on liquidity around the ex date is analyzed by applying to the previous variables, a statistical methodology based on the excesses of value of each variable, within a time period that includes the split date, regarding a reference level.

Let's choose, for example, the volume variable. As a reference level, let's take the time series average, of approximately two months of trading days prior to the split, beginning on $s_1 = -50$ and finishing on $s_2 = -11$, relative to the ex-split day,

$$\overline{V_i} = \frac{1}{T}\sum_{\tau=s_1}^{s_2} V_{i\tau},$$

in which, T is the estimation period, $T=s_2-s_1$; $V_{i\tau}$, is the volume of the asset i on day τ of the estimation period, and $\overline{V_i}$, is the average volume of the asset i during the estimation period.

An analysis of the excesses in value is carried out on each of the eleven days that surrounding the split ex date, $D=s_4-s_3+1$, with $s_3=-5$ and $s_4=+5$, which constitute the event period. The abnormal volume on one day t of the event period is defined as the excess with respect to the average,

$$AV_{i\tau} = V_{i\tau} - \overline{V_i}, \qquad s_3 \le \tau \le s_4$$

and, the average excess volume in time τ is defined as the cross-sectional average of the estimated abnormal volume of the individual assets,

$$\overline{AV_\tau} = \frac{1}{N}\sum_{i=1}^{N} AV_{i\tau},$$

where N is the number of stocks in the sample.

Assuming the null hypothesis that the average abnormal volume is equal to zero, and supposing that the abnormal volumes are independent in cross-section, the following statistic is distributed as a t with an N-1 degree of freedom,

$$\frac{\sum_{i=1}^{N} AV_{i\tau}}{\left[N\hat{\sigma}_i^2\right]^{1/2}},$$

the denominator is the standard deviation in the volume in the estimatation period.

This same methodology is applied to the rest of the variables: market's depth, proportional spread, number of trades and mean value of a trade.

The results of this procedure are shown in Table 3. The depth of the market increases systematically and significantly after the split, indicating a greater possibility to execute orders at the best bid-ask price. The daily average of securities, which is 1.795 shares during the pre-split reference period, increases to between 49% and 139% following the split, which suggests that the number of shares increases to 874 on day +1, and to 2.490 on day +2. On the quote side, the relative spread experiences a significant rise of 0.68% on the ex-split day, (t-statistic of 5.08 and p value of zero), as well as after the split, on days +2, +3, and +4, with abnormal values regarding their references of 0.28, 0.48 and 0.37%, respectively.

The daily mean of volume is slightly more than 1.700 million pesetas during the reference period. On day –1, the transacted value increases to approximately 1.600 million pesetas (t-statistic of 2.82 and p value of 0.01), which represents 93% of the level that is considered normal, and in the ex date an substantial increase of 3,700 million, 213% is seen in the volume. The effect of the split on the volume appears to be concentrated on the split ex day and on the day before it, with no statistically significant effects being observed on any of the other days preceding or following the operation.

On the other hand, the number of trades per day increases notably, from the mean level of approximately 259 daily exchanges, beginning on day –1, an increase that remains at statistically significant levels throughout the period, with the exception of day +4. The greatest increase, 83%, with an excess of 213 trades is seen on day +2, followed by day zero, with an increase of 76%, 197 more transactions than during the reference period.

As a consequence of the variations in the transacted value and in the number of trades, the mean value per trade doesn't show significant abnormal values on days –1 and 0, when the increase in the number of trades is not sufficiently great to compensate for the parallel increase in the volume. However, the combination of both changes, starting from the day after the split, causes outstanding reductions in the volume of pesetas transacted on day +1, and an important, though not significant fall on days +3 and +4.

In sum, a significant growth is observed in the depth and an increase is seen in the cost of liquidity, reflected in the widening in the relative spread. Likewise, a rise in volume is noted on the split date and on the day before it. In the transacted value there has also been, a persistent increase in the number of trades, which is not great enough, however, to maintain a significant reduction of the mean per trade.

The fact that the market's depth, the proportional spread and the volume increase simultaneously, doesn't mean that they can be explained from this perspective. The observed increase in trades is consistent with the increase in the number of shareholders, while the fact that their average size doesn't reduce doesn't support the idea of a growth in the number of small investors. Based on this evidence, we cannot conclude that splits contribute systematically to an improvement in the stock's liquidity and, consequently, the validity of this argument, as a complete explanation of the abnormal returns observed, is not valid.

THE EFFECT OF THE BID-ASK SPREAD ON THE ABNORMAL RETURNS

In this section, we examine the possibility that the positive abnormal split ex date returns, observed in the previous sections, may not be real, but rather the result of the institutionalized characteristics of the trading process that can affect to the closing prices. We particularly examine the possible existence of a measurement effect due to the spread and, specifically, the relationship between the positive abnormal returns on the split date and the bid/ask spread. In this regard, there are two aspects that should be considered: In the first place, the possibility suggested by Grinblatt and Keim (1991), that the abnormal returns could have an upward bias because the closing prices on and after the split ex date tends to cluster at the ask. Secondly, we should keep in mind that the positive bias could also be the consequence of a greater increase in the ask price, relative to the bid, as Maloney and Mulherin (1992), and Conrad and Conroy (1994) point out.

CHANGES IN THE ORDER FLOW.

Regarding the first question, the split drastically increases the number of outstanding shares, altering the normal order flow in the market. After the execution of the split, the buy orders outnumber the sell orders. The relative prevalence of the buy orders would increase the tendency for the prices to close at the ask, which may well be the cause of the positive abnormal returns observed on the split date. The prediction, initially suggested by Grinblatt, Masulis and Titman (1984), is that before the split, the sell orders prevail, and that on the split date a systematic change takes place and there is a tendency to buy. This imbalance can continue for several days after the split. The empirical evidence, however, has detected a relative balance of orders before the split date and a significant shift to the propensity of buy orders on the split date which continues for several days following the split (Grinblat and Titman, 1991; Maloney and Mulherin, 1992; and Conrad and Conroy, 1994).

We examine here, the possible existence of an imbalance in the order flow, in which the prices tend to close nearer to the ask price, resulting in an upward estimation of the abnormal return, by examining the relative position of the closing prices to the bid and ask prices. One way of identifying the side on which the transactions begin, and which has been presented in the literature, (Glosten and Harris, 1988), consists of comparing the closing price with the average of the bid and the ask prices. It is assumed that a trade is effected as the result of a buy order if the closing price is higher than the mean bid-ask price, and that it was from a sell order if the closing price is lower.

In Table 4 the frequency with which the closing prices are greater or lower than the average bid and ask prices has been computed. Contrary to what might have been expected, a prevalence of buy orders is noted between days –4 and –1, with significant differences, of 40% on day –4, and of 30% on days –3, and –2. The greater relative number of buy orders explains the abnormal positive returns seen on day –3, but not the negative returns on the other two days. The buy orders on the split date are also larger than the sell orders, but no change is noticed in their distribution with respect to the previous days. The order flow

changes after the split, with sell orders prevailing on day's +1 and +4, although, in no case is the difference statistically significant. Starting on day +5, the buy orders prevail once more. Therefore, beginning with a balanced situation on day –5, a change is appreciated in the order flow between days –4 and +4, with the buy orders showing a significant prevalence on the split day, on the days preceding it, and with sell orders prevailing during the four following days.

The theory predicts a systematic change in the order flow on the split date, from the bid prices to the ask prices, which, however, is not observed in our results. The behavior observed suggests two changes in the order flow on the dates surrounding the split: an increase in buy orders a few days before the split and a decrease in these, with a subsequent increase in sell orders the day after. With regard to the order flow, this evidence is only partially consistent with the average positive return observed on the split date.

TABLE 4. THE ORDER FLOW AROUND THE SPLIT EX DATE.

DAY	BUY ORDERS	SELL ORDERS	DIFFERENCE	T STATISTIC	L_τ	T STATISTIC
-5	50	50	0	0.00	0.496	
-4	70	30	40	2.53	0.639	
-3	65	35	30	1.90	0.628	
-2	65	35	30	1.90	0.592	
-1	55	45	10	0.63	0.485	
0	55	45	10	0.63	0.562	0.08
1	45	55	-10	-0.63	0.429	1.90
2	40	60	-20	-1.26	0.402	2.28
3	50	50	0	0.00	0.511	0.78
4	40	60	-20	-1.26	0.422	2.00
5	60	40	20	1.26	0.576	-0.11
(-5,-1)	61	39	22	1.39	0.568	
(+1,+5)	47	53	-6	-0.38	0.468	2.16

The possible imbalance in the flow of orders can be analyzed with an alternative method, by adding the distribution of the closing prices relative to the bid-ask quotes on any given day, and calculating of the "location ratio" proposed by Keim (1989):

$$L_{i\tau} = \frac{P_{Ci\tau} - P_{B_{i\tau}}}{P_{Ai\tau} - P_{B_{i\tau}}}$$

in which, $P_{Ci\tau}$, is the closing price of the asset i on the date τ, $P_{Bi\tau}$, is the bid price and $P_{Ai\tau}$ the ask price, both of which are measured at the closing. On any given day, if the closing price of the asset is equal to the bid price, the ratio has a value of zero. A value between zero and 0.5 indicates that the closing price is closer to the bid (selling pressure). For a closing price that is equal to the ask price, the ratio has a unitary value. A value of between 0.5 and 1 therefore, indicates that the closing price is nearer to the ask price (buying pressure). In general, the value of the ratio should remain somewhere between zero and one. Nevertheless, the lack of synchronization between the closing prices and the bid-ask prices can produce values that are higher than one or lower than zero. When this happens, you can either discard the observation or put values of one and zero to all the ratios that either surpass the unit value or that have a negative value, respectively. We have chosen the latter solution.

On the right side of Table 4, we present, in the cross-sectional mean of the ratios L_i, which succinctly expresses the relationship between the closing prices and the ask-bid quotes. In the lower part, the averages of the ratio L_i during the pre-split and post-split periods, are shown. In the former period, the ratio has a value of 0.568, reflecting the prevalence of the buy orders, significantly different from the mean level (t-statistic of 2.16 and a probability of 0.06) which reaches a ratio of 0.468 during the latter period, indicating the existence of sales pressure. If we observe the individual values of the ratio for each day t, important increments are observed between days –5 and –4 and between days –1 and 0. This latter increase, in particular, could explain, at least partially, the positive returns on the split date. Also, the pre-split average and the value of the ratio of the day it corresponds to, is significantly higher than the individual values of the ratio on days +1, +2 and +4, indicating a clear tendency for the prices to be fixed in the vicinity of the bid price.

The evidence arrived at is not consistent with the results previously detected in other countries. The difference is to be found in the prevalence of buy orders before and on the split and the significant change toward a propensity of sell orders on the days following the split. It seems obvious that the analyses done on the order, up to now, don't provide an adequate explanation of the abnormal returns observed.

B. Relative Spread and Bid-Ask Prices

Another factor that could influence the upward bias in the measured return is the increase in the percentage spread due to an asymmetric abnormal jump in the ask price in relation to the bid. Maloney and Mulherim (1992), consider this phenomenon to be the product of the simultaneous buying pressure, which pushes up the ask price, together with the investors' increased disposition to sell, which makes the bid price remain relatively flat. Conrad and Conroy (1994), offer an inventory explanation of this phenomenon. They argue that, besides altering the order flow, splits also affect their size, thereby influencing the bid/ask spread. In this regard, they suggest that, as consequence of the split, the sell orders are relatively larger than the buy orders, which temporarily unbalances the specialists' inventories and increases their costs. To compensate for this, they enlarge the spread, increasing the ask price. The increase in the spread would reflect the aversion of the specialists to accumulate inventory. Their efforts to diminish their inventories, during the following days, would reduce the returns or even make them negative.

Table 5. Average Abnormal Return and Cumulated Abnormal Return with Ask and Bid prices.

Day	$AARASK_\tau$	t	$AARBID_\tau$	t
-5	-0.043	-0.04	0.083	0.10
-4	-0.006	-0.01	-0.078	-0.09
-3	0.136	0.12	0.042	0.04
-2	-0.096	-0.08	-0.707	-0.64
-1	0.211	0.17	0.795	0.61
0	9.523	7.41	0.192	0.12
1	-7.264	-5.17	1.379	0.62
2	4.558	2.81	0.307	0.10
3	-0.484	-0.24	-0.238	-0.05
4	-0.112	-0.04	-0.177	-0.03
5	-0.476	-0.14	-0.384	-0.04
$CAAR(\tau_1,\tau_2)$				
(-5,+5)	5.947	2.87	1.213	0.62
(-5,-1)	0.202	0.09	0.135	0.06
(+1,+5)	-3.778	-0.80	0.886	0.07

We now analyze the possibility of a positive bias due to an increase in the ask price, calculating the abnormal returns on the bid and the ask prices separately. In the following Table 5, the average abnormal returns are reflected for each day of the event period and for different intervals of accumulation, calculated in the same way as the abnormal returns of the closing prices in Table 1. One can observe that the average abnormal returns of the ask and the bid quotes follow a similar course during days –4 and –1, and days + 3 and +5. However, their behavior is clearly asymmetric on the ex-date and on the two days following it, as we can appreciate in Figure 1. While the bid return is positive, although not significant, between days –1 and +2, with maximum values of 1.3%, on the day following the split, the return on the ask price fluctuates greatly, increasing to 9.5% on the ex-date, falling to –7.2% the following day, increasing again to 4.5% on day +2, and becoming more stabilized later on. As a consequence, the cumulated abnormal returns during the eleven-day period examined appear to be much higher when they are calculated with the ask prices, 5.9%, than when they are computed with the bid, just 1.2%. This asymmetry in the bid-ask behaviour, allows the investors to obtain extraordinary returns of 4.7%, following a trading rule that consists of buying the shares at the ask price five days before the split and selling them at the bid price five days later. A similar behavior, although far less pronounced, has been observed in other markets. The variations of the proportional spread noted in the previous section and the results obtained here, seem compatible with the inventory interpretation, in the sense that the bid-ask quotes should exaggerate the fluctuations in the price, inducing the uninformed investors to move to the opposite side of the market.

C. BIASES IN THE AVERAGE ABNORMAL RETURNS

A way of reducing the influence of the changes observed in the frequency of the transactions to close at the ask, consists of measuring the returns using bid prices. The returns that are estimated by using closing prices include bid-ask errors, but those that are calculated from bid to bid quotes eliminate the spread effect. A comparison of the bid return with that of the closing price is a direct test of the impact of the spread on the return. If the change in the return distribution is apparent, the abnormal returns should disappear, since the returns calculated with the bid are not significantly different from zero.

Conrad and Conroy (1994) have proposed a way of analyzing the joint effect of the changes in the order flow and of the increase of the spread on the returns. It consists of breaking down the abnormal closing price returns into three components: one that reflects the abnormal return calculated with the bid prices, another that reflects the effect of the order flow, and a third element that takes into account the additional bias which is not explained by the previous causes:

$$AR_{iC\tau} = AR_{iB\tau} + (D_{i\tau} - L_{i\tau-1})(s_{it} - s_{i\tau-1}) + v_{i\tau}$$

where, $AR_{iC\tau}$, is the abnormal return of the asset i on the closing price, $AR_{iB\tau}$, is the abnormal return calculated on the bid price, $s_{i\tau}$, is the proportional spread defined as $(P_{iA\tau} - P_{iB\tau})/P_{iB\tau}$, and $v_{i\tau}$ is the part of the abnormal return that is due to other unidentified causes. In turn, the effect of the order flow incorporates two factors: the changes in the tendency of the prices to close at the ask or at the bid rate, $(D_{i\tau} - L_{i\tau-1})$, and the changes in the spread $(s_{it} - s_{i\tau-1})$. The bias will be positive if the tendency to close at the asking price and the relative spread increase simultaneously, $L_{i\tau}$ is higher than $L_{i\tau-1}$, and the relative spread, s_τ, is greater than $s_{\tau-1}$. If the two factors move in different directions, the bias could be either positive or negative, depending on which effect is more dominant.

TABLE 6: EFFECT OF THE ORDER FLOW ON THE AVERAGE ABNORMAL RETURN WITH CLOSING PRICES

DAY	$AARCP_\tau$	$AARBID_\tau$	$(L_{i\tau}-L_{i\tau-1})(S_{i\tau}-S_{i\tau-1})$
-5	-0.52	0.08	-0.02
-4	-0.16	-0.07	0.00
-3	0.37	0.04	0.00
-2	-0.64	-0.70	-0.02
-1	0.09	0.79	-0.07
0	1.02	0.19	0.56
1	0.29	1.37	-1.44
2	-0.02	0.30	-0.11
3	-0.02	-0.23	-0.01
4	0.01	-0.17	0.00
5	-0.00	-0.38	-0.02

In Table 6, we observe that the return calculated with bid prices that correspond to the ex-day is positive, at 0.19%, but much lower than the average abnormal return on the closing prices, at 1.02%. On that same date, the tendency of the prices to close at the ask price increases, as well as a significant increase in the proportional spread. The combined effect of both changes contributes to an increase in the average abnormal return of 0.56%. On the whole, 18% of the average return on the ex-date would be due to the real return or the return on the bid, and 54% to the bias introduced by the order flow and the change in the spread. The remaining 28% being attributable to unidentified causes.

CONCLUSIONS

In this study, the behavior of the prices of twenty stock splits in the Spanish capital market, over the period 1994 through 1997, has been analyzed. Firstly, we have examined whether the movement of the prices on the split ex date generates extraordinary returns, using the traditional procedure to estimate abnormal returns, taken from the event studies methodology, based on the market model as a standard of expected returns. From the application of this method we find that splits generate on average positive abnormal return of 0.93%, only on the ex-date, and not on the previous days or on the days following it.

Secondly, we analyzed whether the results previously obtained could possibly be the result of an incorrect specification of the market model. To do so, we modified the basic model to take an empirical characteristic of the daily returns into account, such as the conditional heteroscedasticity. The estimate done presents, in general, a slight under-estimation of the average abnormal returns, using the standard model, and it confirms that splits produce positive abnormal returns on the ex date. We then examined whether the election of the split factor was coherent with the optimal trading range hypothesis and whether this approach could offer an explanation for the results obtained. A cross-sectional regression, with the split factor as a dependent variable, confirmed that managers decide split their shares in order to bring their prices within a conventional range. However, by means of a similar procedure to that of the events methodology, and using variables, such as the depth, the volume, the number of trades, the average value per trade and the relative spread, we have demonstrated that, contrary to what was expected, splits do not seem to have any favorable effect on a stock's liquidity, in the sense that, although there is a temporary improvement in the trading activity, the cost of the liquidity undergoes a sustained increase. Finally, we examined whether the abnormal returns detected were the result of biases introduced by the market microstructure. In this sense, our analyses support the hypothesis that the abnormal split ex date returns are due to an increase in the tendency of the prices to close at the ask price, since a relative prevalence of buy orders is detected before and on the split execution date and a clear propensity of sell orders are seen after this date. On the whole, the evidence obtained supports the argument that splits produce positive abnormal returns, concentrated on the ex-date, although approximately half of this, around 54%, may be attributed to the spread's fluctuations, induced by the behavior of the agents who provide liquidity to the market.

NOTES

1 The splits also cause changes in the variance of the abnormal returns (Ohlson and Penman, 1985). This paper focuses on the change in the mean level of the abnormal returns.

2 See the work of Dewachter and León (1996) for the particular case of the Spanish market.

3 The model has also been modified to take the possible existence of seasonality in the daily returns into account and, concretely, given the high concentration of splits on Mondays, the possibility that the returns of this day are inferior to thoseof the remaining days of the week. However, it has been proven that the coefficients associated with the dummy variable that reflects this effect in the model are, in practically all the cases, statistically indistinguishable from zero.

4 From January 1, 1992 the commissions are free. The brokers only have the obligation of making their commissions public and communicating them to the CNMV (equivalent to the SEC in Spain). In July 1998 the fixed part fluctuated between zero and 5.000 pesetas. The range of variation of the variable part was between 0,2% and 5%.The representative structure was around 1.000 pesetas per trade and 0.5% on its value.

5 See the annual report of the Madrid Stock Exchange for the year 1998.

6 The stock splits, nevertheless, increase the costs of administration of the portfolios, particularly those of custody and administration.

7 Besides the differences in the cost structures we must also keep in mind that in the U.S. market, any distribution of shares that are higher than 25%, independently of their true nature are considered splits. This is to say, the minimum level of the split ratio is 1.25, while in the Spanish market it is 2.

8 This happens because the investors that possessed holding previously to the split, they will offer a greater number of shares when selling them postsplit

9 Alternatively, it can be done by calculating the return with the mean bid-ask prices. If the abnormal return is apparent, the return on the mean price should be lower and not significant. Nevertheless, regarding the return's at the bid, this procedure has the disadvantage of supposing that the trades close with the same probability either at the ask quote or at the bid quote, which, in fact, does not happen around the ex date.

10 In fact Conroy and Conrad (1994) simplify the formula, supposing the crossed effects of the variations in the localization ratio and the spread to be nil, and ignoring other possible influences.

REFERENCES

ANGEL, J.J. (1997), "TICK SIZE, SHARE PRICES AND STOCK SPLITS", *JOURNAL OF FINANCE* 52, PP. 655-681.

ASQUITH, P., HEALEY, P., AND PALEPU, K. (1989), "EARNINGS AND STOCK SPLIT", *ACCOUNTING REVIEW* 44, PP. 387-403.

BAKER, H.K., AND PHILLIPS, A. (1994), "WHY COMPANIES ISSUE STOCK DIVIDENDS", *FINANCIAL PRACTICE AND EDUCATION* 3, FALL, PP. 29-37.

BERNDT, E., HALL, B., HALL, R. AND HAUSMAN, J. (1974), "ESTIMATION AND INFERENCE IN NON LINEAR STRUCTURAL MODELS", *ANNALS OF ECONOMIC AND SOCIAL MEASUREMENT* 4, PP. 653-665.

BLACK, F. (1986), "NOISE", *JOURNAL OF FINANCE* 36, PP. 529-544.

BRENNAN, M.J., AND COPELAND, T. (1988), "STOCK SPLITS, STOCK PRICES AND TRANSACTION COSTS", *JOURNAL OF FINANCIAL ECONOMICS* 22, PP. 83-101.

BRENNAN, M., AND HUGHES, P. (1991), "STOCK PRICES AND THE SUPPLY OF INFORMATION", *JOURNAL OF FINANCE* 46, PP. 1665-1691.

BOLLERSLEV, T., ENGLE, R. AND NELSON, D. (1992), "ARCH MODELS", EN ENGLE, R. Y MCFADDEN, D. (EDS.), ***HANDBOOK OF ECONOMETRICS*** (VOLUME 4).
BOLLERSLEV, T., AND WOOLDRIDGE, J. (1992), "QUASI-MAXIMUM LIKELIHOOD ESTIMATION AND INFERENCE IN DYNAMIC MODELS WITH TIME-VARYING COVARIANCES", ***ECONOMETRIC REVIEW*** 11.
CONRAD, J.S., AND CONROY, R. (1994), "MARKET MICROSTRUCTURE AND EXDATE RETURN", ***JOURNAL OF FINANCE*** 49, PP. 1507-1519.
CONROY, R.M., HARRIS, R.S., AND BENET, B. (1990), "THE EFFECT OF STOCK SPLITS ON BID-ASK SPREADS", ***JOURNAL OF FINANCE*** 45, PP. 1285-1295
COPELAND, C.J. (1979), "LIQUIDITY CHANGES FOLLOWING STOCK SPLITS", ***JOURNAL OF FINANCE*** 34, PP. 115-141.
CORHAY, A., AND RAD, A.T., (1996), CONDITIONAL HETEROSKETASTICITY ADJUSTED MARKET MODELS AND AN EVENT STUDY, ***QUARTERLY REVIEW OF ECONOMICS AND FINANCE***, 36(4), 529-538.
DEFEO, V.J., AND JAIN, P. (1991), "STOCKS SPLITS: PRICE PER SHARE AND TRADING VOLUME", EN LEE, C. (ED.), ***ADVANCES IN QUATITATIVE ANALYSIS OF FINANCE AND ACCOUNTING***, JAI PRESS, GREENWICH, CT.
DESAI, A., NIMALENDRAN, M., AND VENKATARAMAN, S. (1998), "CHANGES IN TRADING ACTIVITY FOLLOWING STOCK SPLITS AND THEIR EFFECT ON VOLATILITY AND THE ADVERSE INFORMATION COMPONENT OF THE BID-ASK SPREAD", ***JOURNAL OF FINANCIAL RESEARCH*** 21, PP. 159-185.
DEWACHTER, H., AND LEÓN, A. (1996), "THE INFORMATION CONTENT OF OPTIONS ON THE IBEX-35", ***REVISTA ESPAÑOLA DE ECONOMÍA*** 13, PP. 159-180.
EADES, K., HESS, P., AND KIM, H. (1984), "ON INTERPRETING SECURITY RETURNS DURING DE EXDIVIDEND PERIOD", ***JOURNAL OF FINANCIAL ECONOMICS*** 13, PP. 3-53
ENGLE, R., AND BOLLERSLEV, T. (1986), "MODELLING THE PERSISTANCE OF CONDITIONAL VARIANCES", ***ECONOMETRIC REVIEW*** 5.
FAMA, E., FISHER, L., JENSEN, M. AND ROLL, R. (1969), "THE ADJUSTMENT OF STOCK PRICES TO NEW INFORMATION", ***INTERNATIONAL ECONOMIC REVIEW*** 10, PP. 1-21.
GLOSTEN, L. AND HARRIS, L. (1988), "ESTIMATING THE COMPONENTS OF THE BID-ASK SPREAD", ***JOURNAL OF FINANCIAL ECONOMICS*** 21, PP. 123-142.
GRAY, S., SMITH, T., AND WHALEY, R. (1996), "STOCK SPLITS: IMPLICATIONS FOR MODELS OF THE BID/ASK SPREAD", MIMEO, FUQUA SCHOOL OF BUSINESS, DUKE UNIVERSITY.
GRINBLATT, M., AND KEIM, D. (1991), "STOCK SPLITS AND STOCKS RETURNS FOR OTC STOCKS: THE EFFECTS OF INVESTOR TRADING AND BID-ASK SPREADS", WORKING PAPER, WHARTON SCHOOL UNIVERSITY OF PENNSILVANIA.
GRINBLATT, M.S., MASULIS, R., AND TITMAN, S. (1984), "THE VALUATION OF STOCK SPLITS AND STOCK DIVIDENDS", ***JOURNAL OF FINANCIAL ECONOMICS*** 13, PP. 461-490.
KEIM, D.B. (1989), "TRADING PATTERNS, BID-ASK SPREADS AND ESTIMATED SECURITY RETURNS: THE CASE OF COMMON STOCKS AT CALENDAR TURNING POINTS", ***JOURNAL OF FINANCIAL ECONOMICS*** 25, PP. 75-98.
KRYZANOWSKI, L., AND ZHANG, H. (1993), "MARKET BEHAVIOR AROUND CANADIAN STOCK SPLIT EX DATES", ***JOURNAL OF EMPIRICAL FINANCE*** 1, PP. 57-81.
LAKONISHOK, J. AND VERMAELEN, T. (1986), "TAX-INDUCED TRADING AROUND EX_DIVIDEND DAYS", ***JOURNAL OF FINANCIAL ECONOMICS*** 16, PP. 287-319.
LAKONISHOK, J., AND LEV, B. (1987), "STOCK SPLITS AND STOCK DIVIDENDS: WHY, WHO AND WHEN", ***JOURNAL OF FINANCE*** 42, PP. 913-932.
LAMOROUX, C.G., AND POON, P. (1987), "THE MARKET REACTION TO STOCK SPLITS", ***JOURNAL OF FINANCE*** 42, PP. 1347-1370.
MALONEY, M.T., AND MULHERIN, J.H. (1992), "THE EFFECTS OF SPLITTING ON THE EX: A MICROSTRUCTURE RECONCILITIATION", ***FINANCIAL MANAGEMENT*** 21, PP. 44-59.
MCNICHOLS, M., AND DRAVID, A. (1990), "STOCK DIVIDENDS, STOCK SPLITS AND SIGNALING", ***JOURNAL OF FINANCE*** 45, PP. 857-879.
MURRAY, D. (1985), "FURTHER EVIDENCE ON THE LIQUIDITY EFFECTS OF STOCK SPLITS AND STOCK DIVIDENDS", ***JOURNAL OF FINANCIAL RESEARCH*** 8, PP. 59-67.
OHLSON, J.A., AND PENMAN, S.H. (1985), "VOLATILITY INCREASES SUBSEQUENT TO STOCK SPLITS. AN EMPIRICAL ABERRATION", ***JOURNAL OF FINANCIAL ECONOMICS*** 8, PP. 59-67.
PILOTTE, E., AND MANUEL, T. (1996), "THE MARKET'S RESPONSE TO RECURRING EVENTS. THE CASE OF STOCK SPLITS", ***JOURNAL OF FINANCIAL ECONOMICS*** 41, PP. 11-127.
ROZEFF, 1998, "STOCK SPLITS: EVIDENCE FROM MUTUAL FUNDS", ***JOURNAL OF FINANCE*** 53, PP. 335-339.
RUBIO, G., AND TAPIA, M., (1996), "ADVERSE SELECTION, VOLUME, AND TRANSACTIONS AROUND DIVIDEND ANNOUNCEMENTS IN A CONTINOUS AUCTION SYSTEM, ***EUROPEAN FINANCIAL MANGEMENT***, VOL. II, PP. 39-69.
STOLL, H.R., AND WHALEY, R.E. (1983), "TRANSACTION COSTS AND SMALL FIRM EFFECT", ***JOURNAL OF FINANCIAL ECONOMICS*** 6, PP. 57-79.

ANEXO

TABLE A.1 STOCK SPLITS SAMPLE (1994.1997)

CODE	COMPANY	SPLIT EX DATE DD/MM/YY		$(1+FD_i)^A$	PAR VALUE[B]	
					BEFORE	AFTER
VCP	VALENCIANA DE CEMENTOS PORTLAND	27/07/94	W	12	2400	200
BAY	BAYER	03/06/96	M	10	50	5
CBK	COMERZBANK	01/10/96	T	10	50	5
PSG	PROSEGUR	11/10/96	T	5	500	100
VID	VIDRALA	12/05/97	M	2	500	250
SAN	B. SANTANDER	09/06/97	M	3	750	250
CTG	GAS NATURAL	21/07/97	M	4	600	150
BBV	BBV	21/07/97	M	3	780	260
BKT	BANKINTER	21/07/97	M	3	1500	500
ELE	ENDESA	24/07/97	TH	4	800	200
CPF	CONSERVERA CAMPOFRIO	29/07/97	T	2	1000	500
POP	B. POPULAR	08/09/97	M	4	500	125
ACS	ACS	13/10/97	M	4	1000	250
BCH	B.CENTRAL HISPANO	13/10/97	M	2	500	250
FCC	FOMENTO DE CONSTRUCCIONES Y CONTRATAS	20/10/97	M	4	1000	250
IZB	INMOBILIARIA ZABALBURU	30/10/97	M	4	1000	250
OBR	OBRASCON	05/12/97	F	5	500	100
CTF	CORTEFIEL	18/12/97	J	2	100	50
MAP	CORPORACION MAPFRE	22/12/97	M	2	500	250
MPV	MAPFRE VIDA	22/12/97	L	2	500	250

[a] FDi is the split factor or rate of growth in the number of shares, $(1+FD_i)$ is the split ratio.

[b] The par value of all the shares is in pesetas, except Bayer and Commerzbank that are expressed in German marks.

TABLE 3: EFFECTS OF THE SPLIT ON STOCK LIQUIDITY.

Day	*Depth*	*t*	*Proportional Spread*	*t*	*Volume*	*t*	*Transactions*	*t*	*Mean Value per Trade*	*t*
Mean	1795.00		0.71		1,759,296,205		258.69		4,725,759	
-5	-171.15	-0.56	-0.05	-0.37	-120,047,028	-0.21	-11.34	-0.34	124,267	0.08
-4	-410.10	-1.35	-0.05	-0.37	-120,739,362	-0.21	10.16	0.30	-407,802	-0.26
-3	-216.25	-0.71	-0.01	-0.09	106,083,869	0.18	42.26	1.26	-625,477	-0.40
-2	-256.45	-0.84	0.71	5.35	49,416,428	0.09	31.31	0.93	-255,568	-0.16
-1	-284.90	-0.94	-0.13	-0.95	1,637,475,983	2.82	120.46	3.58	40,456	0.03
0	1152.95	3.79	0.68	5.08	3,754,644,180	6.47	197.26	5.86	1,130,272	0.72
1	874.20	2.88	0.05	0.39	-806,317,756	-1.39	113.51	3.37	-2,943,765	-1.87
2	2490.35	8.20	0.28	2.12	191,413,651	0.33	213.46	6.34	-1,431,729	-0.91
3	1313.70	4.32	0.48	3.59	-127,555,607	-0.22	111.31	3.31	-2,047,221	-1.30
4	1281.85	4.22	0.37	2.80	-662,325,582	-1.14	43.81	1.30	-2,606,664	-1.66
5	1174.50	3.86	0.12	0.89	-40,757,545	-0.07	97.21	2.89	247,761	0.16